Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/747
TURKEY
February 1964
Submitted in:
ENGLISH and FRENCH

Confidential until official release during Conference

Abstract

The Programs for Utilization of the Research Reactor TR-I at the Çekmece Nuclear Center

Sait Akpinar

Çekmece Nuclear Research and Training Center
Istanbul, Turkey

The TR-I (Turkish Reactor I) is a research facility located on the grounds of the Çekmece Nuclear Research and Training Center, 30 km west of Istanbul. The Center is owned and operated by the Turkish Atomic Energy Commission whose chairman is the Minister of Energy and Natural Resources. The pool type reactor has a maximum power of I Megawatt; it uses 90% enriched Uranium. The reactor and its building was constructed by the U.S. AMF Co. The first criticality was achieved on 6th of January 1962.

The experimental facilities of the reactor consist of a horizontal thermal column, 6 beam tubes of different cross sectional area, one through tube, a spent-fuel dry-gamma irradiation room, a small hot cell accessible from the pool.

The programs of utilization of the TR-I are based on the fact of its being the only facility of its kind in the country. The main task of the Çekmece Nuclear Center is the use of TR-I for research, training and

irradiations in the fields of Physics, Chemistry, Biology, Reactor Technology, Agriculture and Medicine.

The progress of programs in these fields, the organization of the Center, its collaborations with the country's universities and foreign laboratories will be explained. The significance of a Research Reactor Facility for a developing country and the policies adopted in operating the Center and the TR-I will briefly be discussed.

A/CONF.28/A/748

Readex
Fiche

Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/748
NORWAY
February 1964
Original: ENGLISH

Confidential until official release during Conference

Abstract

ON THE DYNAMIC BEHAVIOUR OF BOILING WATER SHIP REACTORS

by

H. Christensen, K.O. Solberg and A.O. Waagbø
Institutt for Atomenergi
Kjeller, Norway

Boiling water reactors with natural circulation are inherently simple, and this type is economically attractive for small size, nuclear power plants. Such reactors are, however, particularly sensitive to accelerational disturbances, and, in the past, have been discarded for ship propulsion use.

This paper gives some results from a comprehensive study of the dynamic characteristics of boiling water reactors for marine use, with special attention to the applicability of natural circulation.

It is shown that large nuclear power transients can certainly be expected, but the resulting variations in fuel temperature, heat flow to coolant, reactor pressure, and steam flow to turbine are all within tolerable limits. It is concluded that although the nuclear power transients will inconvenience the designers of control systems, a natural circulation system can be operated reliably and safely at full power even under adverse sea conditions. Further, relatively simple means exist for improving the dynamic performance.

The paper gives a brief description of the theoretical reactor model used for the study, and some new features of the model are pointed out. A linearized version of the model was programmed for an analogue computer, which was used for most of the calculations carried out. A somewhat simplified, non-linear

model, has been programmed for a digital computer, and also used in the study.

Considerable effort has been put into the testing of the model against experimental data from reactors and boiling loops. This work will be reviewed, with emphasis on the use of data from a boiling loop in vertical motion at the Institutt for Atomenergi, as data of this type have not been readily available in the past.

Next, several examples of reactor responses to different disturbances will be presented. Dynamic design limitations will be discussed, and it is attempted to arrive at relevant design criteria for natural circulation boiling water ship reactors. At a cost, certain parameters can be chosen to optimize the reactor system from the dynamic point of view.